

Title: ADVANCED POWER ELECTRONICS APPLICATIONS IN POWER

Module Code:

Core/Elective:

Aims & Objectives:

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| To introduce the concepts of power electronics based conversion and |
| To analyse functional requirements for power converters and intercon- |
| To analyse methods and algorithms of control of power electronics |
| To discuss and analyse the usage of multiple power electronics |
| To assess the application of power electronics devices in Power |
| Students will be encouraged to apply methodologies and knowledge |

Brief description of the module:

Introduction to Power Electronics Energy Conversion, Fundamentals

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| Lecture hours: | 15 |
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| Tutorial hours: | 6 |
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| Laboratory/Coursework hours: | |
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| Other (specify): |
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| LEARNING OUTCOMES: |
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| <i>Knowledge and understanding</i> |
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1. to identify and analyse the functional blocks of a power electronic (PE) converter;

2. to understand it as Power System(PS) device;to understand the role of controlling reactive and active power flow as an element of PS for PE devices;

3. to know principles of operation and models of PE devices;

4. to understand the operation of PS integrating PE devices;

5. to analyse the behaviour of PSs with a distributed architecture allocating several and different PE devices.

Skills

1. to design a PE device as a PS element;
2. to analyse the behaviour of a PE device as a FACTS device;
3. to develop a model for PE devices either for steady-state regimens or transient ones;
4. to analyse PS behaviour in a well-known simulation environment;
5. to evaluate robustness and controllability of PS including PE

devices as FACTS devices;

6. to assess the integration of FACTS devices into the PS;

OUTLINE SYLLABUS:

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| Introduction to Power Electronics Energy Conversion; Current and |
| Fundamentals of measurement methods related to energy quality (1) |
| Reactive and active power flow control in DC/DC and DC/AC conversion |
| Dynamic characteristics and control requirements of power electronic |
| Design of power converters and control methodologies for some of |
| Stability control and harmonic content control in Power Systems (2) |
| Analysis of operation of power systems incorporating distributed |
| Analysis of criteria to decide the application of PE devices into P |

Coursework (including word length and relative weighting):

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| Nine hours of computer based laboratory work. A formal report is p |
| The course work contributes 30% to the final module mark. |

Examinations (including examination length, number of questions)

There is a 2 1/2 hour written exam with 5 questions out of which students

Directed reading (state if material provided):

Power Electronics Handbook, Muhammad H. Rashid ; ACADEMIC PRESS

Improvement in the Quality of Delivery of Electrical

Series: [Power Systems](#), **Benysek**
Power Quality Enhancement Using Custom Power Devices

Flexible AC Transmission Systems (FACTS), edited by

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| Staff involved |
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| Module leader: Prof. Adriano Carvalho |
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| Other staff: Prof. Armando Araújo |
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| Prof. António Martins |
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| Date of last revision: |
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| 20 | June 2008 |
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